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THE OVERCHARGE AND OVERDISCHARGE BEHAVIOR OF POLYMER
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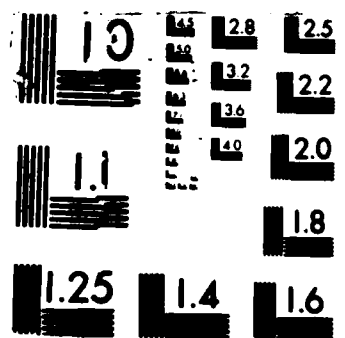
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The Overcharge and Overdischarge Behavior
of Polymer Electrolyte Cells

by

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Paper to be presented at
172nd Meeting of Electrochemical Society, Inc.
October 18-23, 1987
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<p>The overcharge and overdischarge behavior of the cell $\text{Li}/(\text{PEO})_8\cdot\text{LiCF}_3\text{SO}_3/\text{V}_6\text{O}_{13}$ is being investigated with particular emphasis on the changes taking place at the cathode.</p> <p>Cells placed on overcharge have shown an inability to discharge. Optical microscopy has revealed severe electrolyte and cathode degradation with the presence of white fluffy deposits located at the cathode-electrolyte interface. This was shown by EDAX analysis to be predominantly rich in salt. Vanadium was also detected at the Li-electrolyte interface.</p>					
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The Overcharge and Overdischarge Behavior
of Polymer Electrolyte Cells

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The overcharge and overdischarge behavior of the cell $\text{Li} | (\text{PEO})_6 \cdot \text{LiCF}_3\text{SO}_3 | \text{V}_6\text{O}_{13}$ is being investigated with particular emphasis on the changes taking place at the cathode.

Cells were cycled until constant capacity was reached. A typical cell was then placed on overcharge at constant current above the nominal O.C.V. of 3.2V until it reached a plateau in the V-t curve. (This occurred at 4.95V.) The cell was held at this potential and the current monitored as a function of time. After a lapse of several hours the current showed erratic behavior and then became constant. On open-circuit the cell voltage decreased to 1.2V over a period of 2 hours.

Post-mortem examination of the cell revealed severe electrolyte and cathode degradation. The electrolyte showed a marked discoloration that was clearly visible in an optical microscope. The interfacial region of the cathode-electrolyte interface was much rougher than the innermost cathode structure. In addition, the presence of a white fluffy deposit in this interfacial region was shown by EDAX analysis to be predominantly rich in S indicating the possibility of lithium salt, LiCF_3SO_3 .

Scanning electron microscopy was used to show large void areas and a more crystalline structure of the cathode, in sharp contrast to the original

cathode which was much finer and amorphous. Cross-section analysis of the cell using EDAX revealed the presence of vanadium at the Li-electrolyte interface.

A typical cell examined in the charged state showed the cell components to be intact with no visible deterioration. The cathode was smooth and uniform and the electrolyte maintained its original color. The white fluffy deposits found in the overcharged state were absent in this case. Furthermore there was no evidence of vanadium at the Li-electrolyte interface.

Further work is in progress to determine the level of overcharge that can be tolerated in this type of cell. Results for the overdischarged behavior are still incomplete.

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